

AFRL-SR-AR-TR-02-0178
AD-



Acquisition of a Nanometer-scale Auger Electron Spectroscopy Analytical Microprobe

F49620-00-1-0247



Leonard J. Brillson
Ohio State University Research Foundation

20020614 183

Approved for public release; distribution unlimited

Air Force Research Laboratory
Air Force Office of Scientific Research
Arlington, Virginia

NE

REPORT DOCUMENTATION PAGE

AFRL-SR-AR-TR-02-

0178

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Service, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE (DD-MM-YYYY) 25-03-2002		2. REPORT DATE March 25, 2002		3. DATES COVERED (From - To) April 1, 2000-Sept. 30, 2001	
4. TITLE AND SUBTITLE Acquisition of a Nanometer-scale Auger Electron Spectroscopy Analytical Microprobe.				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER F49620-00-1-0247	
				5c. PROGRAM ELEMENT NUMBER NI/DURIP	
6. AUTHOR(S) Leonard J. Brillson				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) The Ohio State University Research Foundation 1960 Kenny Road Columbus, Ohio 43210				8. PERFORMING ORGANIZATION REPORT NUMBER Final Technical	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Air Force Office of Scientific Research 801 N. Randolph St., Room 732 Arlington, Virginia 22203-1977				10. SPONSOR/MONITOR'S ACRONYM(S) AFOSR NI/DURIP	
				11. SPONSORING/MONITORING AGENCY REPORT NUMBER	
12. DISTRIBUTION AVAILABILITY STATEMENT Unclassified Unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT (Executive Summary Attached)					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Leonard J. Brillson
U	U	U	UU	2	19b. TELEPHONE NUMBER (include area code) 614-292-8015

Executive Summary

We have acquired an Auger Electron Spectroscopy Microprobe Analysis System for elemental and bonding analysis of electronic materials, equipped with specimen stage, ion beam depth analyzer, and ultrahigh vacuum (UHV) preparation chamber interfaced to an existing UHV scanning electron microscope. The specific equipment purchased is: JEOL USA, Inc. Auger Electron Spectroscopy Depth Profiling Hardware and Software for the JAMP-7800F. Its acquisition enhances a number of DOD-funded programs and student training that involve development of high power and high frequency electronic materials with superior performance, especially improving the state-of-the-art and availability of radiation-tolerant semiconductor electronics for applications in the space environment.investigators.

Final Report on AFOSR F49620-00-1-0247 DURIP

**ACQUISITION OF A NANOMETER - SCALE AUGER
ELECTRON SPECTROSCOPY ANALYTICAL MICROPROBE**

Air Force Office of Scientific Research


ATTN: NI/DURIP

4040 Fairfax Dr., Suite 500

Arlington, VA 22203-1613

Program Manager: Dr. G. Witt

Submitted by:



Leonard J. Brillson

Principal Investigator

Voice: (614) 292-8015

Fax: (614) 688-4688

Departments of Electrical Engineering and Physics

And the Center for Materials Research

The Ohio State University

205 Drees Lab, 2015 Neil Ave.

Columbus, OH 43210

We have acquired an Auger Electron Spectroscopy Microprobe Analysis System for elemental and bonding analysis of electronic materials, equipped with specimen stage, ion beam depth analyzer, and ultrahigh vacuum (UHV) preparation chamber interfaced to an existing UHV scanning electron microscope. Its acquisition enhances a number of DOD-funded programs that involve development of high power and high frequency electronic materials with superior performance, especially improving the state-of-the-art and availability of radiation-tolerant semiconductor electronics for applications in the space environment. This facility establishes the leading facility for nanometer – scale chemical and electronic structure characterization at any university and at modest cost. The proposed instrumentation has been combined with a 25 keV scanning electron microscope employed for high spatial and energy resolution cathodoluminescence spectroscopy. This facility is unique in its capability to detect optical emission from electronic defects and band structure extending from the surface into the bulk of semiconductor and insulator multilayer structures with nanoscale resolution. The combination of facilities is providing state-of-the-art correlations of local chemical composition, bonding, and potential with electronic traps within the field and gate oxides of CMOS device structures and at GaN and GaAs transistor interfaces. The facility has already been used extensively to study the electronic properties of advanced semiconductors such as GaN, AlGaN, and SiC, their heterojunctions and their interfaces with metals. This instrument will also benefit a number of other AFOSR investigators studying corrosion inhibitors for high strength Al alloys in aerospace applications. It has been installed in a multidisciplinary laboratory and available to researchers from several departments at Ohio State, Vanderbilt University, North Carolina State University, UC Santa Barbara, Ohio University, the University of Cincinnati, as well as the Air Force Research Laboratories at Wright – Patterson AFB. Hence, the acquisition of this instrumentation provides world-class and unique facilities in the area of electronic materials characterization to a diverse community of AFOSR- and other DOD-funded